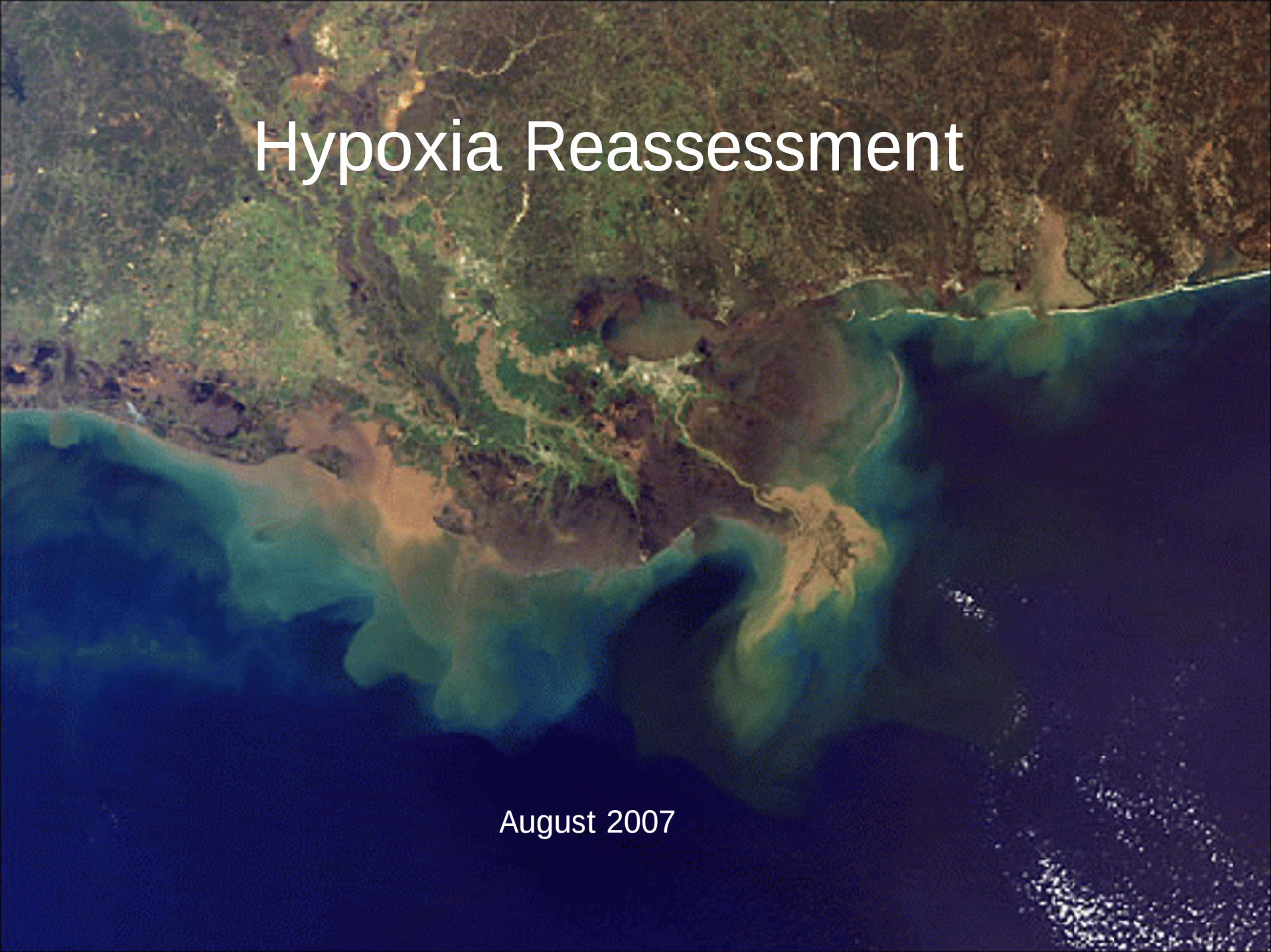
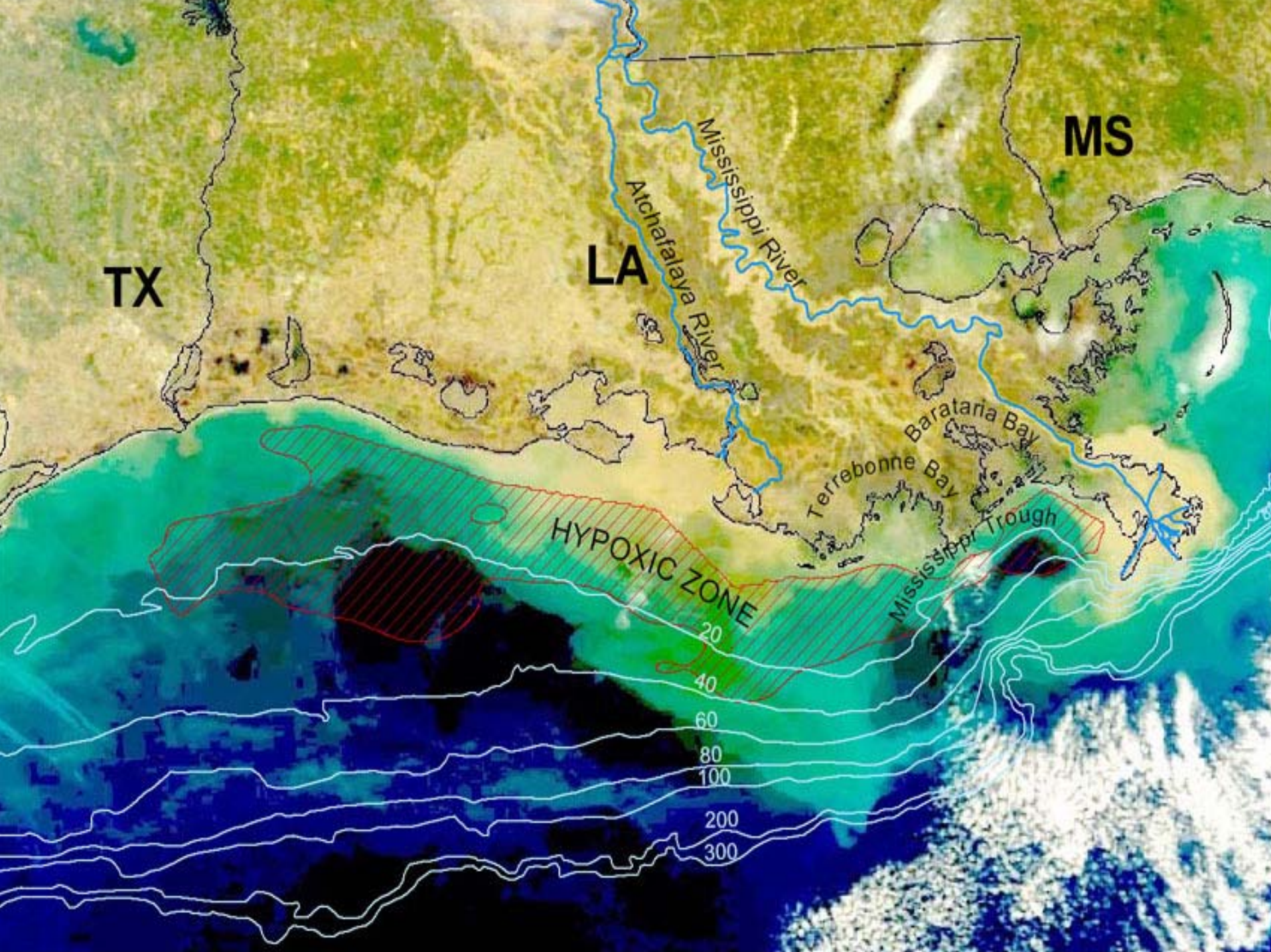
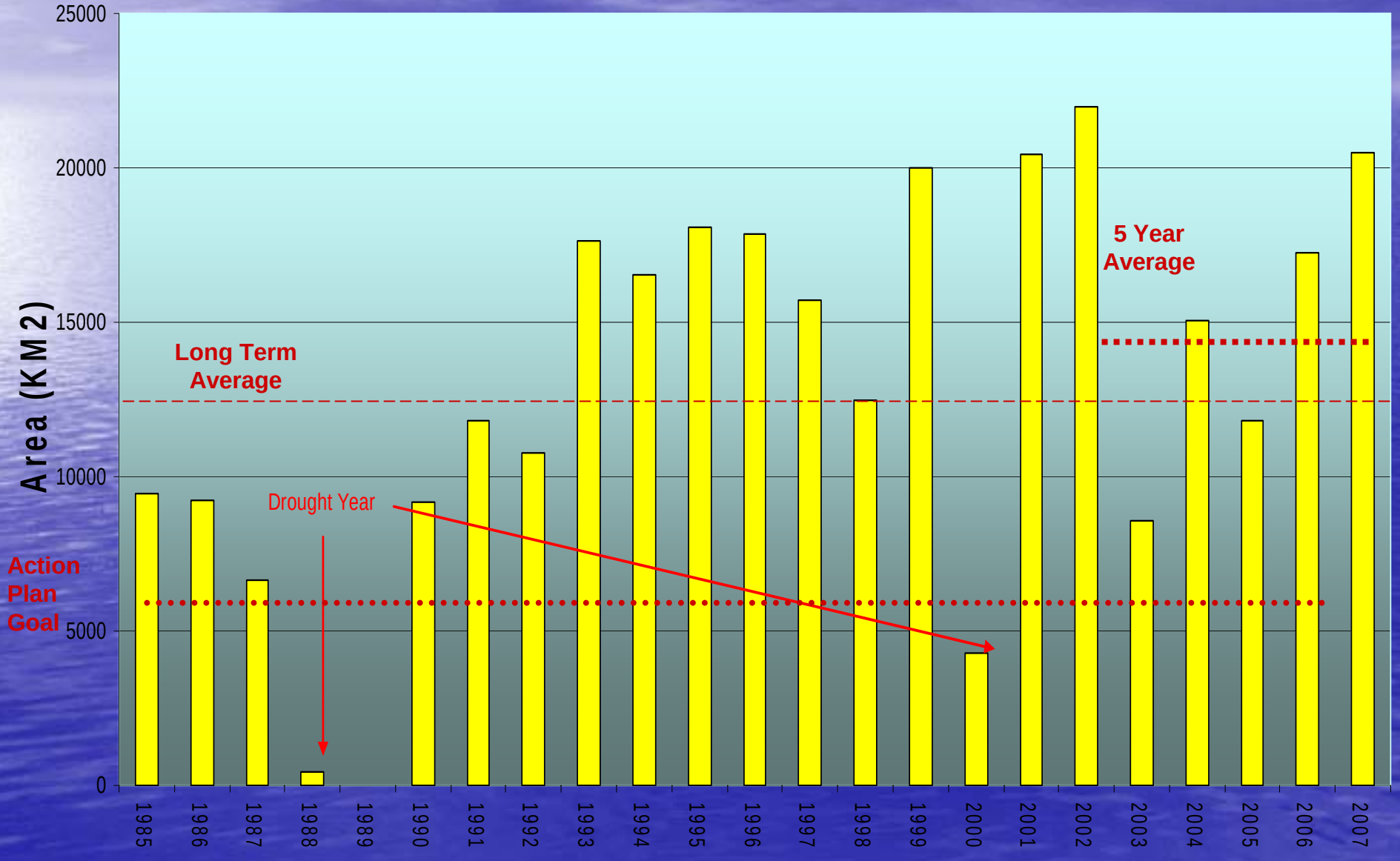

Hypoxia Reassessment
August 2007


TX
LA
MS
Mississippi River
Atchafalaya River
Barataria Bay
Terrebonne Bay
Mississippi Trough
HYPOXIC ZONE
20
40
60
80
100
200
300

Estimated Area of Bottom Water Hypoxia in Mid Summer



Reassessment Schedule

Action	Start	Completion
Reg. 4 White Paper Review	Jan. 2005	June 2005
Bibliography	Fall 2004	Summer 2005
Upper MS Workshop		Sept 2005
Science Symposium on Causes		Spring 2006
Lower MS Workshop		Summer 2006
SAB Expert Panel of Causes	Summer 2005	Summer 2007
Recommendations Synthesis & Revisions	Summer 2007	Fall 2007
T.F Adoption of Draft Revised Action Plan	Fall 2007	Fall 2007
Public Comment		
Adoption of Final Action Plan		

2007 DECISION SCHEDULE

MONTH	DECISION	CC	SAB	TASK FORCE
June	Comments on Initial SAB Report	Call June 28	SAB Meeting June 13-15	TF Meeting June 11-12
July	•TF request for Public Comments •Yes/No Revise Goals	Call July 26	SAB Draft July 23	
August	•Respond to Public Comment •Actions Draft	•Face to Face August 14-16 •Call Aug 30	Public Comment Call	
September	•Review SAB Recommendations •Complete Funding Plan	Call Sept 27	Charter Board Review	
October	•Preliminary draft GHAP 2008 •Tracking Progress Proposal •Release draft 2008 GHAP	Call Oct 25		
November	Revise 2008 GHAP	Call Nov 29	Final SAB	
December		Call TBD		
January	CC agree to 2008 GHAP	Face to Face TBD		
February	Address issues related to 2008 GHAP	Call TBD		TF Meeting
March	•TF AGREE TO 2008 GHAP •Publish			

The SAB Charge

- Address the state of the science of hypoxia as well as the scientific basis for mitigating hypoxia through management options
- Focus on scientific advancements since 2000 relating to 3 general areas:
  - Characterization of the Causes of Hypoxia
  - Characterization of Nutrient Fate, Transport and Sources
  - Scientific Basis for Goals and Management Options

➢ SAB report URL - http://www.epa.gov/sab/pdf/5-24-07_hap_draft.pdf

SAB Preliminary Findings

- Importance of Processes
  - Physical
  - Biogeochemical
  - Hydrologic
  - Circulation
  - Stratification
  - Freshwater Input
  - Timing
- Dual Nutrient Strategy

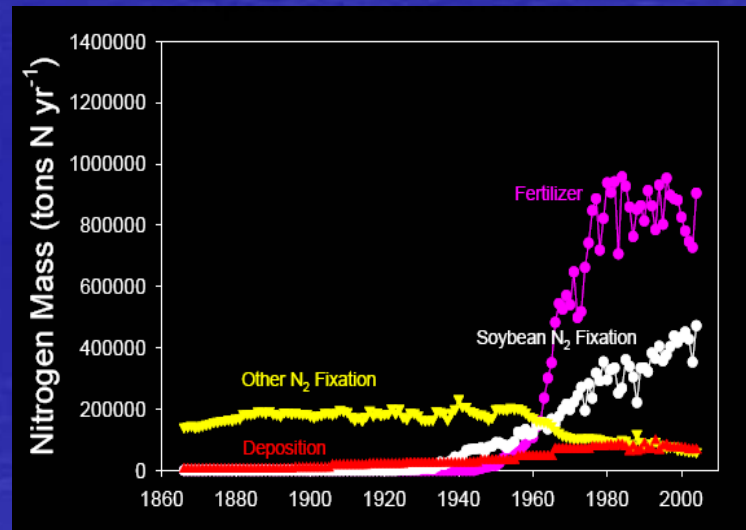
Nutrient Fate, Transport and Sources – Flow and Flux

- Fewer rivers and streams are currently monitored
- USGS improved nutrient flux estimates
- Annual MARB freshwater discharge increased slightly
- Annual nitrate flux decreased slightly
- Upper MS & Ohio-TN - 84% NO_3 & 64% P flux to Gulf
- Tile-drained, corn-soybean landscapes very N leaky
- Target the tile-drained Corn Belt region of the MARB for N and P reductions in both surface and sub-surface waters.

Nutrient Fate, Transport and Sources – Mass balance

- Non-point sources of N (1999-2005)
  - 54% fertilizer
  - 37% N_2 fixation
  - 9% atmospheric deposition
- Manure more significant source of P than N
- New estimates of point source N & P
  - 22% of N flux

    (up from 11% in 2000)
  - 34% of P flux



Nutrient Fate, Transport and Sources

- In-stream removal (denitrification)
  - significant in during warn, low flow periods, but not significant during high flows in Jan-June (peak nitrate export)
- The *HAP recommends*
  - enhance hydrologic exchange & retention on floodplains
  - targeted wetlands restoration

Scientific Basis for Goals and Management Options

- The HAP discusses
  - The importance of adaptive management
  - Setting targets for nutrient reduction
  - Protecting water quality & social welfare in the Basin while reducing the areal extent of the Gulf hypoxic zone
- The *HAP recommends*
  - Conservation Practice management framework
  - Strategic conservation measures & approach to evaluate success of reaching goals
  - Enhanced monitoring at different temporal and spatial scales
  - Modeling and monitoring approaches addressing critical management questions

Setting targets for nutrient load reduction to achieve coastal goal

- The *HAP recommends*
  - 45% N load reduction goal
  - 40% P load reduction goal
- The *HAP indicates*
  - Reassess/revise N & P goals within adaptive management framework as new information becomes available
  - More important to move in a “directionally correct” fashion and learn from monitoring results, rather than delay action

Protection of water quality and social welfare in the basin

- The *HAP finds*
  - **coastal goal appropriate for now**
  - may need to be revised in the future
- Reducing hypoxic zone & enhancing Basin water quality are inextricably & positively linked
- Co-benefits of nutrient reduction
  - greenhouse gas mitigation
  - improved wildlife habitat & recreational opportunities
  - flood control & other ecosystem services
- Social benefits will likely exceed social cost over the long run, if not the short term, & thus enhance social welfare

Most Effective Agricultural Practices

- Optimal choices will likely include:
  - drainage water management,
  - conservation tillage,
  - manure management,
  - changing fertilizer application rates and timing,
  - crop rotation,
  - cover crops,
  - conservation buffers,
  - wetlands enhancement
- Watersheds with greatest potential for N and P reductions should be targeted for action to ensure cost-effectiveness
- Targeting allows optimization of cost and benefits.
- An array of economic incentives are recommended to encourage conservation

Most Effective Actions for Other Nonpoint Sources

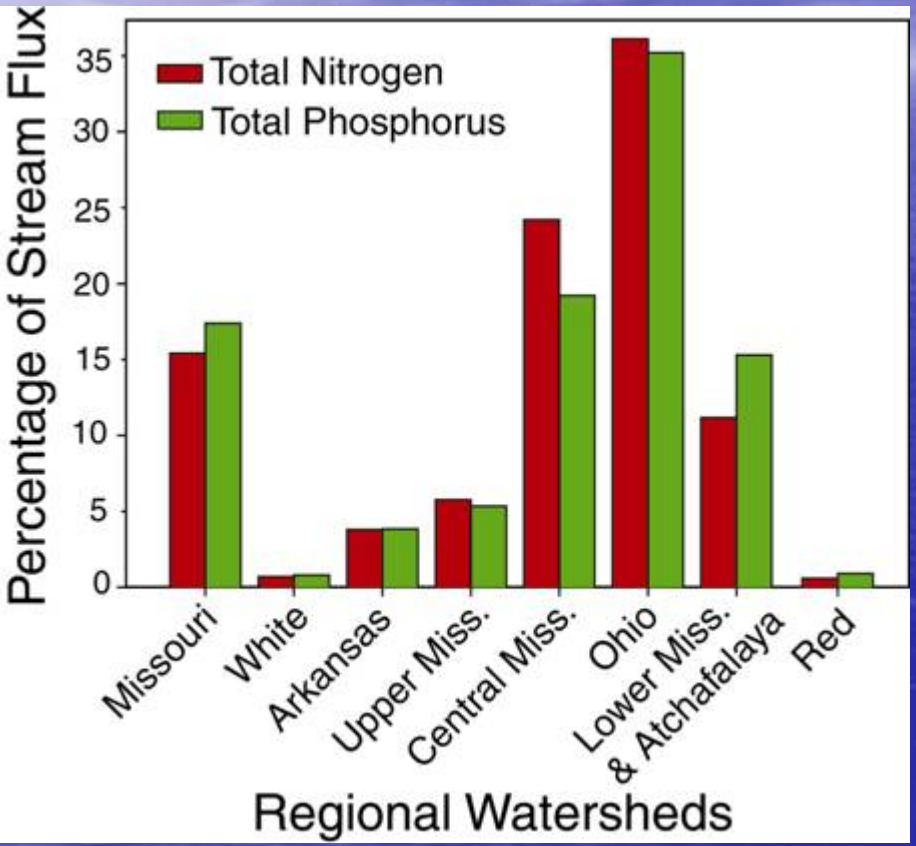
Atmospheric deposition and urban/suburban storm water runoff are the two major non-agricultural NPS

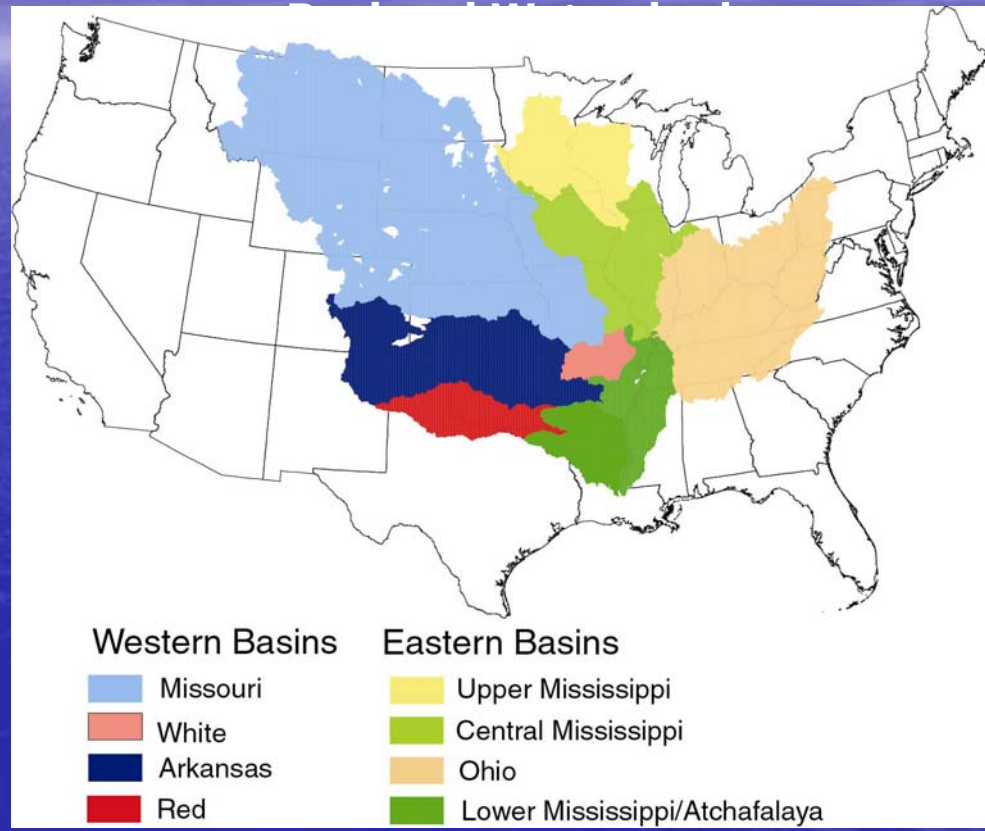
- Tighter limits on sources of NOx emissions would assist hypoxia reduction and improve water quality.
- Incorporating water quality benefits into decisions involving:
  - Retirement or retrofitting of old coal-fired power plants,
  - NOx controls - extension of current summertime NOx standards to a year-round requirement,
  - Emissions standards & mileage requirements for SUV's, heavy trucks and buses.

Effective Technologies for Municipal and Industrial Point Sources

- The *HAP recommends*
  - Upgrade sewage treatment plants in MARB to Biologic Nutrient Removal (BNR) or Enhanced Nutrient Removal (ENR) technologies (N: 3.0 mg/l & P: 0.3 mg/l)
  - MARB sewage treatment plants upgrade to achieve total N concentrations of 3 mg/L and total P concentrations of 0.3 mg/L.
- For industries with high nutrient discharges
  - Use a targeted permit by permit approach.
  - Evaluate for opportunities to reduce N and P discharges through pollution prevention, process modification or treatment

Sparrow Model Regional Contributions to Stream Nutrient Flux to the Gulf of Mexico





Total Nitrogen – Ranked based on total delivered incremental yield

Rank	HUC	HUC NAME	STATES	Incremental Yield (kg/km2)
1	7120003	Chicago	IL IN	5,249
2	5120205	Flatrock-Haw	IN	2,861
3	5120113	Lower Wabash	IL IN KY	2,739
4	8020201	New Madrid-St. Johns	KY MO	2,690
5	5120107	Wildcat	IN	2,677
6	5120206	Upper East Fork White	IN	2,535
7	7120005	Upper Illinois	IL	2,348
8	5140202	Highland-Pigeon	IN KY	2,341
9	5120204	Driftwood	IN	2,335
10	5120105	Middle Wabash-Deer	IN	2,329

Total Phosphorus – Ranked based on total delivered incremental yield

Rank	HUC	HUC NAME	STATES	Delivered Incremental Yield (kg/km2)
1	7120003	Chicago	IL IN	504
2	8020201	Middle Kaskaskia	IL	317
3	5120101	Upper Wabash	IN OH	273
4	8020204	Lower Kaskaskia	IL	269
5	8030207	L'anguille	AR	251
6	8030209	Cache	AR MO	245
7	5100102	Lower Great Miami	IN OH	223
8	5120206	Lower White	IN	200
9	8070100	Bayou Meto	AR	198
10	8090100	Tallahatchie	MS	196


Questions?